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(71)Applicant : TOSOH CORP

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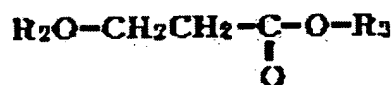
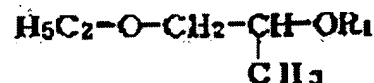
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## (54) COATING SOLUTION FOR LEVEL DIFFERENCE SUBSTRATE

## (57)Abstract:

PURPOSE: To obtain the coating soln. which is good in coatability on level differences, imparts a high degree of flatness to a substrate having ruggedness and has high safety by using specific org. compds. as the essential component of a solvent.

CONSTITUTION: The essential components of the solvent of the coating liquid for level difference substrates consisting of a resin and the solvent or the resin, additives and the solvent are formed of the org. compds. expressed by formula I or formula II. In the formulas I, II, R1, denotes hydrogen or-C(=O)CH3; R2, R3, denote a methyl group or ethyl group. The org. compds. expressed by the formulas I, II include a propylene glycol ethyl ether; alkyl alkoxy propionate system, etc. The propylene glycol ethyl ether system in such a case include propylene glycol ethyl ether, etc. Or the alkyl alkoxy propionate system includes ethyl-3-ethoxy propionate, etc.



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Summary.

(57) [Abstract]

[Objects of the Invention] The application nature on a level difference is good, advanced flat nature is given to a ground with the irregularity which is an important technical technical problem common to the manufacturing process of a solid state image pickup device, a semiconductor integrated circuit element, and a liquid crystal display element, and the high application solution of safety is offered.

[Elements of the Invention] The application solution for level difference substrates which is the organic compound (especially propylene-glycol ethyl ether acetate or ethyl 3-ethoxy propionate) with which the principal component of a solvent is shown in a predetermined general formula in the application solution for level difference substrates which consists of a resin and a solvent or a resin, an additive, and a solvent.

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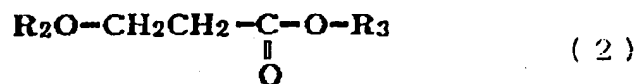
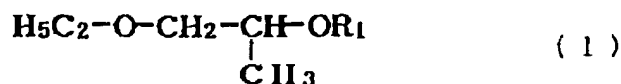
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## CLAIMS

[Claim(s)]

[Claim 1] The application solution for level difference substrates characterized by being the organic compound with which the principal component of a solvent is shown in the following general formula (1) or (2) in the application solution for level difference substrates which consists of a resin and a solvent or a resin, an additive, and a solvent.

[Formula 1]

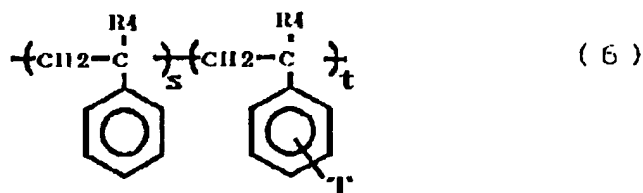
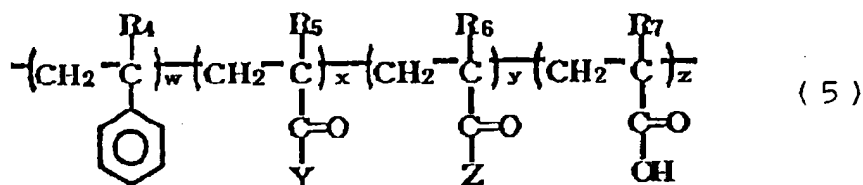
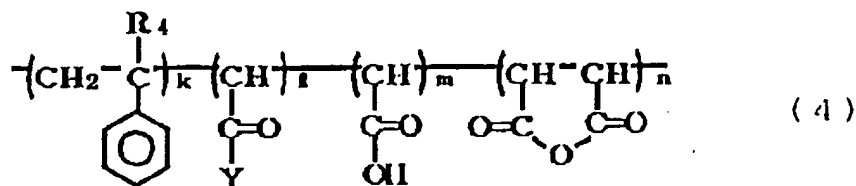
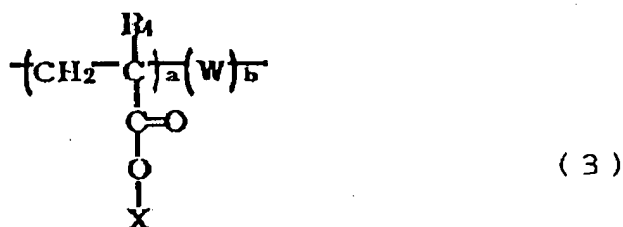


(R1 shows hydrogen or -C(=O) CH3 among a formula, and R2 and R3 show a methyl group or an ethyl group.)

[Claim 2] The application solution for level difference substrates according to claim 1 characterized by an organic compound being propylene-glycol ethyl ether acetate or ethyl-3-ethoxy propionate.

[Claim 3] The application solution for level difference substrates according to claim 1 characterized by being the resin which consists of a structural unit a resin is indicated to be to the novolak resin which is the polycondensation object of a vinyl phenol system polymer, phenols, and an aldehyde or the following general formula (3), (4), (5), or (6).

[Formula 2]



the inside of a formula, and R4 -- hydrogen or a methyl group -- being shown -- R5, R6, and R7 -- hydrogen -- A methyl group, chlorine, or a bromine is shown, X shows the following general formula (7) or (8), and Y and Z are OY1 or NY 2Y3 (Y1, Y2, and Y3 show hydrogen, the alkyl group to carbon numbers 1-6, the allyl group to carbon numbers 6-12, or the aralkyl machine to carbon numbers 7-12.). It is shown. T Chlorine, a bromine, an iodine, a chloro methyl group, a bromomethyl machine, -CH2O(C=O)CH=CHPh or -(C=O)CH=CHPh is shown, W shows the component which can be copolymerized, a, k, m, z, and t show one or more integers, and s shows the integer containing b, l, n, wx, y, and 0

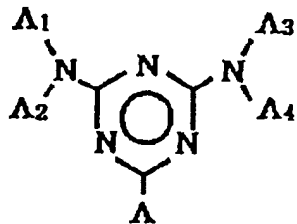
[Formula 3]



[Claim 4] The application solution for level difference substrates according to claim 1 characterized by being the resin with which a resin consists of a structural unit shown in the aforementioned general formula (4) or (5), and being the heat-curing agent which an additive

turns into from the structural unit shown in the following general formula (9).

[Formula 4]



( 9 )

(A shows -NA five A6 (A5 and A6 show hydrogen or -CH<sub>2</sub>alumnus (B shows hydrogen, a carbon number 1, or the alkyl group of 6.).), or a phenyl group among a formula, and A1 or A4 shows hydrogen or -CH<sub>2</sub>alumnus (B shows hydrogen, a carbon number 1, or the alkyl group of 6.).)

[Claim 5] The application solution for level difference substrates according to claim 1 characterized by being the resin which consists of a structural unit a resin is indicated to be to the novolak resin which is the polycondensation object of a vinyl phenol system polymer, phenols, and an aldehyde, the aforementioned general formula (4), or (5), and being the heat-curing agent which consists of a structural unit shown in the sensitization agent and the aforementioned general formula (9) which consist of a sensitization agent [ which an additive turns into from 1 and 2-naphthoquinonediazide sulfonate ] or 1,

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#### DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention gives advanced flat nature in more detail in the substrate which has irregularity about the application solution used for manufacture of a solid state

image pickup device, a semiconductor integrated circuit element, and a liquid crystal display element, and relates to the application solution for level difference substrates excellent in safety.

[0002]

[Description of the Prior Art] In the manufacturing process of a solid state image pickup device, a semiconductor integrated circuit element, and a liquid crystal display element, although a function differs from the purpose, all include the multilayering process by the laminating of an element, and have been the important technical technical problems common to each in the flattening technology of a ground substrate of having irregularity.

[0003] Although the solid state image pickup device has structure which carried out the laminating of the light filter of 2-3 layers, and the interlayer to the element in which the photodiode was formed on the silicon substrate, and prepared the surface-protection film etc. further, the light-filter layer which controlled the size and the configuration highly for the raise in the pixel of a solid state image pickup device is required of formation and carrying out a laminating with high density. For that purpose, flattening, such as flattening on the element of the lowest layer, flattening between each light-filter layer, and a protective coat, is indispensable, and the present condition is becoming a very important process on manufacture.

[0004] Conventionally, as a flattening layer, the polyglycidylmethacrylate (PGMA) type or denaturation PGMA type which can be hardened by heat or light is used, and, generally ethylene glycol ethyl ether acetate is used as an application solvent in that case.

[0005] However, when the rotation application of the organic substance is generally carried out, it is very difficult to form a uniform paint film on the irregularity of a substrate, and it is difficult to carry out flattening of the substrate top completely. Although it corresponds in reducing pitch concentration and controlling the viscosity of flattening material or corresponds by multilayer coating in the present condition, it is hard to say that it has still sufficient flat performance.

[0006] Furthermore, although the solvent consists of ethylene glycol ethyl ether acetate, in the flow of the micro-machining of eye an inadequate hatchet and recent years, dispersion in sensitivity and resolution has very much application nature on a level difference substrate, the positive-type photoresist of the novolak-resin system used for the semiconductor integrated circuit element is becoming a very severe situation, and the request of improvement is strong [ a photoresist ].

[0007] Therefore, as an application solvent, propylene-glycol methyl-ether acetate, an ethyl lactate, a diethylene-glycol wood ether, methoxy propanol, the cyclohexanone, the cyclopentanone, etc. are proposed as an alternative solvent of ethylene glycol ethyl ether acetate (JP,62-105137,A, JP,2-222955,A, JP,3-618,B, JP,3-1659,B, JP,3-6494,B, JP,3-



22619,B, JP,3-1141,A).

[0008]

[Problem(s) to be Solved by the Invention] However, it was that it cannot be easily good that the key objective of these application solvents is in the soluble improvement in the safety to a human body and a resin, a sensitization agent, etc., and there is nothing that is mentioned about a property, especially the application nature on a level difference substrate, and excels also by examination of this invention persons.

[0009] Therefore, it can be said that the present condition is that the application solution with which the application nature on a level difference was good with the solution, and safety was excellent is demanded strongly.

[0010] this invention is made in view of the above troubles, the purpose has the good application nature on a level difference, and it is in giving advanced flat nature to a ground with the irregularity which is an important technical technical problem common to the manufacturing process of a solid state image pickup device, a semiconductor integrated circuit element, and a liquid crystal device, and offering the high application solution of safety.

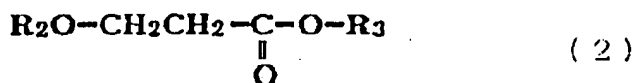
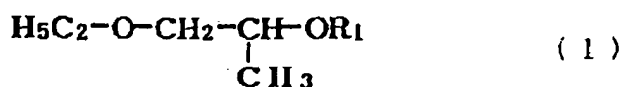
[0011]

[Means for Solving the Problem] In order to solve the above technical problem, as a result of repeating research wholeheartedly about an application solvent, this invention persons find out the solvent which can solve an above-mentioned technical problem, and come to complete this invention.

[0012] That is, this invention is an application solution for level difference substrates characterized by being the organic compound with which the principal component of a solvent is shown in the following general formula (1) or (2) in the application solution for level difference substrates which consists of a resin and a solvent or a resin, an additive, and a solvent.

[0013]

[Formula 5]



(R1 shows hydrogen or -C(=O) CH<sub>3</sub> among a formula, and R2 and R3 show a methyl group or an ethyl group.) this invention is hereafter explained further to a detail.

[0014] The application solution for level difference substrates of this invention consists of a

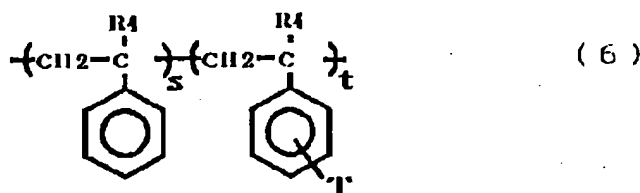
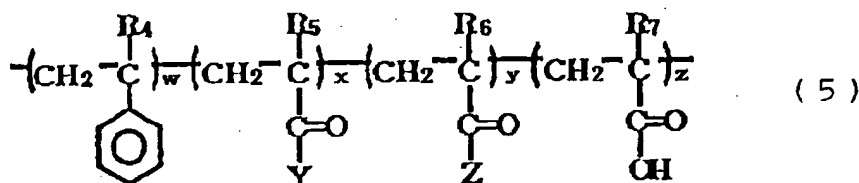
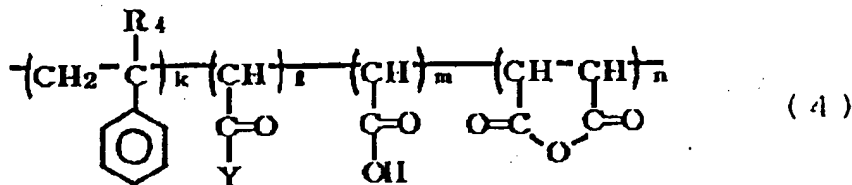
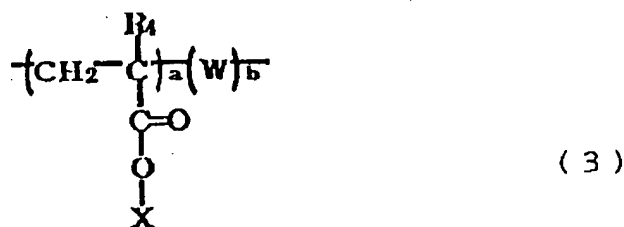
resin and a solvent or a resin, an additive, and a solvent, and the feature is to use a special solvent. That is, the principal component of a solvent is the organic compound shown in the aforementioned general formula (1) or (2).

[0015] A propylene-glycol ethyl ether system, an alkyl alkoxy propionate system, etc. which have the suitable polarity which shows sufficient application nature on a substrate, and a vapor rate as an organic compound with which the principal component of a solvent is shown in the aforementioned general formula (1) or (2) and which are a solvent can be raised. As a propylene-glycol ethyl ether system, propylene-glycol ethyl ether, propylene-glycol ethyl ether acetate, etc. are raised, and ethyl-3-ethoxy propionate, methyl-3-ethoxy propionate, ethyl-3-methoxy propionate, methyl-3-methoxy propionate, etc. are raised as an alkyl alkoxy propionate system. In addition, if propylene-glycol ethyl ether acetate or ethyl-3-ethoxy propionate is used as an application solvent, since an application property will become very good among these, it is desirable.

[0016] As a resin in this invention, it is meltable to a solvent and is not what will be limited especially if it will be in the state in which coat formation is possible. For example, a vinyl phenol system polymer, the novolak resin which is the polycondensation object of phenols and an aldehyde, The resin which consists of a structural unit shown in the following general formula (3), (4), (5), or (6) for example, polyglycidylmethacrylate, and styrene / maleate resin -- Styrene/(meta) acrylic acid resin, an acrylic ester (meta)/(meta) acrylic acid resin, Acrylic-ester resins, such as chloromethylation polystyrene and bromomethyl-ized polystyrene, a methacrylic-ester resin, vinyl ester resin, aromatic vinyl resin, etc. are raised.

[0017]

[Formula 6]



the inside of a formula, and R4 -- hydrogen or a methyl group -- being shown -- R5, R6, and R7 -- hydrogen -- A methyl group, chlorine, or a bromine is shown, X shows the following general formula (7) or (8), and Y and Z are OY1 or NY 2Y3 (Y1, Y2, and Y3 show hydrogen, the alkyl group to carbon numbers 1-6, the allyl group to carbon numbers 6-12, or the aralkyl machine to carbon numbers 7-12.). It is shown. T Chlorine, a bromine, an iodine, a chloro methyl group, a bromomethyl machine, -CH2O(C=O)CH=CHPh or -(C=O)CH=CHPh is shown, W shows the component which can be copolymerized, a, k, m, z, and t show one or more integers, and s shows the integer containing b, l, n, wx, y, and 0

[0018]

[Formula 7]



in addition, as an alkyl group of Y1, Y2, and Y3 in the aforementioned general formula A methyl group, an ethyl group, n-propyl group, an isopropyl machine, n-butyl, An isobutyl

machine, t-butyl, n-amyl group, an isoamyl machine, n-hexyl machine, a cyclohexyl machine, etc. are raised. as an allyl group of Y1, Y2, and Y3 A phenyl group, a tolyl group, a xylyl group, an ethyl phenyl group, a naphthyl group, etc. may be raised, and a benzyl, a phenethyl machine, etc. may be raised as an aralkyl machine of Y1, Y2, and Y3, and the benzene ring may be replaced by halogens, such as chlorine and a bromine, the nitro group, the cyano group, etc. Moreover, although it does not limit especially if it is the component which has an unsaturation double bond and in which a polymerization is possible as a component which can copolymerize W For example, acrylic esters, such as a methyl acrylate, an ethyl acrylate, and a butyl acrylate Methacrylic esters, such as a methyl methacrylate and methacrylic-acid 2-hydroxyethyl Unsaturated carboxylic acids, such as an acrylic acid and a methacrylic acid, an acrylamide, Aromatic vinyls, such as vinyl esters, such as acid amides, such as methacrylamide, vinyl acetate, and a propionic-acid vinyl, styrene, and an alpha methyl styrene, acrylonitrile, a methacrylonitrile, etc. can be raised.

[0019] In these resins, in order to give secondary properties applied to the flat metaplasia ability in the manufacturing process of a solid state image pickup device, a semiconductor integrated circuit element, and a liquid crystal display element, such as a sensitization property and a heat-curing property, the resin which consists of a structural unit shown in the novolak resin which is the polycondensation object of a vinyl phenol system polymer, phenols, and an aldehyde or the aforementioned general formula (3), (4), (5), or (6) is desirable.

[0020] In addition, since transparency of a novolak resin [ a vinyl phenol system polymer and ] improves the denaturation of alkylation, acetylation, etc., or by performing hydrogenation or copolymerization partially in a part of the hydroxyl group, they are desirable as a solid state image pickup device and an object for liquid crystal display elements.

[0021] As an additive in this invention, it is meltable to a solvent, and it does not limit, especially if it will be in the state in which coat formation is possible, and a sensitization agent, a heat-curing agent, a surfactant, a hardening accelerator, a plasticizer, etc. are raised.

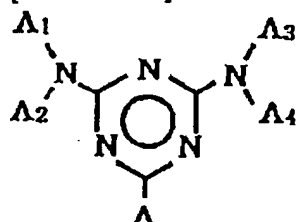
[0022] As for the sensitization agent as an additive in this invention, 1, 2-naphthoquinonediazide sulfonate, an optical radical generating agent, a screw azide, a photo-oxide generating agent, etc. are raised. In addition, 1 and 2-naphthoquinonediazide sulfonate has a desirable property to eye a good hatchet. one -- two -- - -- naphthoquinonediazide -- a sulfonate -- ester -- a component -- \*\*\*\*\* -- two -- four -- - -- dihydroxy -- a benzophenone -- two -- three -- four -- - -- trihydroxy -- a benzophenone -- two -- three -- four -- four -- ' -- - -- a tetrapod -- hydroxy one -- a benzophenone -- two -- two -- ' -- three -- four -- four -- ' -- - -- PENTA -- hydroxy one -- a benzophenone -- a phenol -- one -- three -- five -- - -- trihydroxy --

[0023] As for the heat-curing agent as an additive in this invention, for example, a melamine system compound, a phenol system compound, an azo system compound, an isocyanate system compound, an epoxy system compound, etc. are raised. In addition, the melamine

system compound which a property shows to eye a good hatchet by the following general formula (9) is desirable, and, specifically, can raise a HEKISAMECHI roll melamine and an alkylation HEKISAMECHI roll melamine, a partial MECHIRORU-ized melamine and its alkylation object, TETORAMECHI roll benzoguanamine and alkylation TETORAMECHI roll benzoguanamine, partial MECHIRORU-ized benzoguanamine, its alkylation object, etc.

[0024]

[Formula 8]



( 9 )

(The inside of a formula and A are -NA five A6 (A5 and A6 are hydrogen or -CH<sub>2</sub>alumnus (B shows hydrogen, a carbon number 1, or the alkyl group of 6.)) A1 or A4 shows hydrogen or -CH<sub>2</sub>alumnus (B shows hydrogen, a carbon number 1, or the alkyl group of 6.). In addition as an alkyl group of B in the aforementioned general formula, a methyl group, an ethyl group, n-propyl group, an isopropyl machine, n-butyl, an isobutyl machine, t-butyl, n-amyl group, an isoamyl machine, n-hexyl machine, a cyclohexyl machine, etc. are raised.

[0025] The following solvents added to the grade which does not spoil the property are also included in the additive in this invention. For example, aromatic hydrocarbons, such as acetic ester, such as ketones, such as ethylene glycol monoalkyl ether and its acetate, a propylene glycol monomethyl ether and its acetate, diethylene-glycol monochrome or dialkyl ether, a methyl ethyl ketone, a methyl isobutyl ketone, and a cyclohexanone, ethyl acetate, and butyl acetate, toluene, and a xylene, an ethyl lactate, diacetone alcohol, a dimethylacetamide, a dimethylformamide, N-methyl pyrrolidone, gamma-butyrolactone, etc. are raised. Moreover, you may add surfactants, such as a Nonion system, a fluorine system, and a silicon system, if needed. Furthermore, you may add an additive with a heat-curing accelerator or other compatibility.

[0026] In the case of the combination of the resin shown below, a sensitization agent, and a heat-curing agent, the application solution for level difference substrates in this invention shows the extremely excellent application property.

[0027] That is, if the heat-curing agent of the structural unit shown in the aforementioned general formula (9) is added when a resin is the aforementioned general formula (4) or (5), according to heat bridge formation, it excels in thermal resistance and solvent resistance, and a reliable tough film can be obtained.

[0028] Moreover, when it is the resin which consists of a structural unit a resin is indicated to be to the novolak resin which is the polycondensation object of a vinyl phenol system polymer,

phenols, and an aldehyde, the aforementioned general formula (4), or (5), it can be made the material in which the pattern formation which was excellent in sensitivity and resolution with optical irradiation is possible by adding the sensitization agent which consists of a 1 and 2-naphthoquinonediazide sulfonate.

[0029] Furthermore, if it adds the heat-curing agent shown in the sensitization agent which consists of a 1 and 2-naphthoquinonediazide sulfonate, and the aforementioned general formula (9) in being the resin which consists of a structural unit a resin is indicated to be to the novolak resin which is the polycondensation object of a vinyl phenol system polymer, phenols, and an aldehyde, the aforementioned general formula (4), or (5), it will become the flattening material in which patterning formation and heat bridge formation are possible.

[0030] Usually, although it does not limit, it dissolves in a solvent and especially the application solution for level difference substrates of this invention is obtained so that total solids, such as a resin and an additive, may become 10 - 50% of the weight.

[0031] A sensitization agent has [ a heat-curing agent ] 10 - 30 % of the weight good [ in the application solution for level difference substrates of this invention, ] five to 30% of the weight, for example although it is possible to make it change variously within limits which can maintain a property as for the composition ratio of a resin, a sensitization agent and a resin, a heat-curing agent and a resin, a sensitization agent, and a heat-curing agent to a solid content to a solid content. In addition to a flat performance, within the limits of this, adhesion, transparency, the thermal resistance by hardening, solvent resistance, and/or the stable property with a good resist function are maintainable.

[0032]

[Example] Hereafter, although an example explains this invention in more detail, this invention is not limited to these.

[0033] After forming a photoresist pattern by the photolithography on the silicon substrate in which 2 silicon-oxide films of 11 micrometer \*\* of examples were formed, the photoresist was removed for 2 silicon-oxide films at etching and the last by having used the resist pattern as the mask by the reactive-ion-etching method, and the irregularity of 10 micrometers, and 50-micrometer line / space (last shipment) between 2 silicon oxides was created on the silicon substrate.

[0034] BEKU [ it / with a rotation application / the propylene-glycol ethyl ether acetate solution (25 % of the weight) of polyglycidylmethacrylate (weight average molecular weight  $7 \times 10^4$  (polystyrene conversion)) was applied to 2.5 micrometer \*\*, and / the hot plate ] for 130 degrees C and 10 minutes on this substrate after filtering with 0.2-micrometer filter. Then, when the flatness of a flattening film was observed using the contact process level difference measuring device (the product made from tailor HOBUSON, TARISUTEPPU (trademark)), on the flattening film, irregularity was not observed but flattening was made very completely.

[0035] BEKU [ it / with a rotation application / the ethyl-3-ethoxy propionate solution (25 % of the weight) of example 2 polyglycidylmethacrylate (weight average molecular weight  $7 \times 10^4$  (polystyrene conversion)) was applied to 2.5 micrometer \*\*, and / the hot plate ] for 130 degrees C and 10 minutes on the same substrate as an example 1 after filtering with 0.2-micrometer filter. Then, when the flatness of a flattening film was observed like the example 1, on the flattening film, irregularity was not observed but flattening was made very completely.

[0036] After carrying out the mixed dissolution of example 3 methacrylic-acid / n-butyl acrylate / 25g [ of methyl methacrylate copolymers ] (weight-average-molecular-weight  $1.5 \times 10^4$  (polystyrene conversion), 53 degrees-C [ of glass transition points ], acid number 60), and hexamethoxy MECHIRORU melamine (Mitsui Cyanamid make, Cymel 303 (trademark)) 4.5g, and the propylene-glycol ethyl ether acetate 80g, it filtered with 0.2-micrometer filter and the application solution was adjusted. BEKU [ it / with a rotation application / the application solution was applied on the same substrate as an example 1 at 2.0 micrometer \*\*, and ] for 150 degrees C and 10 minutes on the hot plate. Then, when the flatness of a flattening film was observed like the example 1, on the flattening film, irregularity was not observed but flattening was made very completely.

[0037] Moreover, when the flattening film was flooded with the solvent of water, isopropyl alcohol, 2-butanone, and trichloroethane, a surface dry area and film decrease were not accepted.

[0038] After carrying out the mixed dissolution of the 7g [ of 1 of 25g / of example 4 cresol novolak resins / (m-cresol / p-cresol =6/4 weight average molecular weight 7000 (polystyrene conversion)), and gallic-acid methyl, and 2-naphthoquinonediazide-5-sulfonates ] (triester object), and ethyl-3-ethoxy propionate 70g, it filtered with 0.2-micrometer filter and the resist solution was adjusted. BEKU [ it / with a rotation application / the resist solution was applied on the same substrate as an example 1 at 2.5 micrometer \*\*, and ] for 90 degrees C and 90 seconds on the hot plate. Then, when the flatness of a flattening film was observed like the example 1, on the flattening film, irregularity was not observed but flattening was made very completely.

[0039] Then, it exposed through the reticle in g line reduction projection aligner (GCA company make, DSW-6300A), and negatives were developed in tetramethylammonium hydroxide solution 2.38%. Patterning was able to resolve 0.8micromL/S by 400 mJ/cm<sup>2</sup>.

[0040] The propylene-glycol ethyl ether acetate solution (20 % of the weight) of the chloromethylation reactant (weight average molecular weight  $13 \times 10^4$  (polystyrene conversion), 16.0% of rates of chloromethylation) of example 5 polystyrene was filtered with 0.2-micrometer filter, and the resist solution was adjusted. BEKU [ it / with a rotation application / the resist solution was applied on the same substrate as an example 1 at 2.5 micrometer \*\*, and / the hot plate ] for 120 degrees C and 10 minutes. Then, when the flatness of a flattening film was

observed like the example 1, on the flattening film, irregularity was not observed but flattening was made very completely.

[0041] Example 6 methacrylic acid / n-butyl acrylate / methyl methacrylate copolymer (weight average molecular weight  $1.5 \times 10^4$  (polystyrene conversion)) After carrying out the mixed dissolution of 1 of 53 degrees-C [ of glass transition points ], acid-number 60 25g, and gallic-acid methyl, 6.5g [ of 2-naphthoquinonediazide-5-sulfonates ] (triester object), and hexa butoxy MECHIRORU melamine (Mitsui Cyanamid make, Cymel 1156 (trademark)) 4.5g, and the propylene-glycol ethyl ether acetate 90g, it filtered with 0.2-micrometer filter and the resist solution was adjusted. BEKU [ it / with a rotation application / the resist solution was applied on the same substrate as an example 1 at 2.0 micrometer \*\*, and ] for 90 degrees C and 90 seconds on the hot plate. Then, when the flatness of a flattening film was observed like the example 1, on the flattening film, irregularity was not observed but flattening was made very completely.

[0042] Then, it exposed through the reticle in g line reduction projection aligner (GCA company make, DSW-6300A), and negatives were developed in tetramethylammonium hydroxide solution 0.5%. Patterning was able to resolve 1.0micromL/S by 300 mJ/cm<sup>2</sup>.

[0043] Next, obtained 1micromL/S pattern was heated for 5 minutes on the 150-degree C hot plate. Then, when flooded with the solvent of water, isopropyl alcohol, 2-butanone, and trichloroethane, the surface dry area was not accepted.

[0044] BEKU [ it / with a rotation application / the ethylene glycol ethyl ether acetate solution (25 % of the weight) of example of comparison 1 polyglycidylmethacrylate (weight average molecular weight  $7 \times 10^4$  (polystyrene conversion)) was applied to 2.5 micrometer \*\*, and / the hot plate ] for 130 degrees C and 10 minutes on the same substrate as an example 1 after filtering with 0.2-micrometer filter. Next, according to the example 1, when the flatness of a flattening film was observed, in 0.1 micrometers and 50micromL/S, the irregularity on a flattening film has checked the level difference of 0.4 micrometers, when a ground was 10micromL/S.

[0045] BEKU [ it / with a rotation application / the propylene-glycol methyl-ether acetate solution (25 % of the weight) of example of comparison 2 polyglycidylmethacrylate (weight average molecular weight  $7 \times 10^4$  (polystyrene conversion)) was applied to 2.5 micrometer \*\*, and / the hot plate ] for 130 degrees C and 10 minutes on the same substrate as an example 1 after filtering with 0.2-micrometer filter. Next, according to the example 1, when the flatness of a flattening film was observed, in 0.1 micrometers and 50micromL/S, the irregularity on a flattening film has checked the level difference of 0.3 micrometers, when a ground was 10micromL/S.

[0046]

[Effect of the Invention] Since the application solution for level difference substrates which



used the solvent having suitable polarity and a suitable vapor rate as an application solvent in this invention is used so that clearly from the above explanation, the application nature on a level difference is good, and has the effect to which flattening of the irregular ground can be carried out highly. Moreover, when the material which forms the pattern excellent in sensitivity and resolution can be offered in addition to a flat performance when a sensitization agent is added, and a heat-curing agent is added, it has the effect that the hardening paint film excellent in reliability, such as thermal resistance and solvent resistance, can be obtained. [0047] Since it has the above outstanding properties, the application solution for level difference substrates in this invention can be suitably used as an application solution used for the application on the substrate which has the irregularity at the time of manufacture of a solid state image pickup device, a semiconductor integrated circuit element, and a liquid crystal display element, and processing processing.

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[Translation done.]